## REMARKS

Further consideration of this application courteously is solicited.

*INTERVIEW*

The Examiner's grant of the interview, which was held on July 21, 2010, was appreciated. The undersigned confirms receipt of the Examiner's Interview Summary documenting the course of discussion during the interview. The Examiner's indication that amendments proposed by the Applicants are well taken and appear to overcome the art applied of record, likewise are appreciated.

*CLAIM OBJECTIONS*

Now, we turn to issues raised in the May 10, 2010 Action. First, objections were made to the claims. These objections are understood to have arisen for two reasons, one is because the changes to claim 1 were presented incorrectly in Applicants' Amendment of February 5, 2010. The other is that some of the changes themselves were incorrect.

To address the objections to lines 5 and 7 of claim 1 (as amended on February 5, 2010), it is considered best to present the claims in the way that they should have been presented in the February 5, 2010 Amendment, by an appendix to this paper. Accordingly, Appendix A is attached with a reproduction of the prior listing of claims as modified to make the corrections noted by the Examiner on page 2 of the May 10, 2010 Action under the heading "Claim Objections". With the assistance of this Appendix, the record will be clear in demonstrating how lines 5 and 7 of claim 1 should have appeared in the February 5th Amendment.

As to lines 10, 14, 16, and 17 of (previously-amended) claim 1, this aspect of the objections is addressed by further amendment to claim 1 as made herein. Given the claim amendments in the "Submission", and given Appendix A, it respectfully is submitted that the objection to the claims is overcome, and now should be withdrawn.

*CLAIM REJECTIONS – 35 U.S.C. § 103*

Next, claims 1-9 were rejected under 35 U.S.C. § 103(a) as purportedly obvious over U.S. Publication No. 2002/0130106 to Mertens et al. (hereinafter Mertens) in view of U.S. Patent No. 6,058,945 to Fujiyama et al. (hereinafter Fujiyama). This rejection was the focus of the July 21, 2010 interview. This rejection is traversed.

By this paper, claim 1 has been placed in a form based upon the draft claims transmitted to the Examiner on July 6, 2010, as modified as a result of the discussions during the interview. Any such modifications over the July 6th draft, however, do not alter the arguments in support of the claims as presented by the undersigned during the interview. Amended claim 1 still recites Applicants' cleaning method as comprising three distinct subprocesses, namely a "rinse process", a "transition process", and a "spin dry process", in that particular order.

During the interview, a review was made of each of the sub-step processes of claim 1, and the reasons therefore. By way of review, it is reminded that Applicants' overall substrate cleaning method was devised to handle substrates with both hydrophobic and hydrophilic areas on their surface. Applicants have recognized the difference in drying time between hydrophilic and hydrophobic surfaces during spin-drying. If the substrate simply is rotated in a spin-drying process, the hydrophobic surfaces typically will dry first while rinse liquid remains on the hydrophilic surfaces. The problem in the art has been that liquid thus remaining on the hydrophobic surfaces frequently moves onto a hydrophobic surface that already was dry. This generates water marks in the vicinity of the hydrophilic surface.

Applicants claimed cleaning method addresses the drying time problems of hydrophilic areas by beginning with their "rinse process" that applies "only" pure water to both the hydrophobic and the hydrophilic areas at a "first feed amount". This "first" feed amount produces a relatively thick pure water film that efficiently cleans the substrate. Thereafter, their method calls for the "transition process" which requires reduction in the pure water feed amount in order to reduce the thickness of the water film, but prevent any part, namely the hydrophobic areas, from drying out in advance of the spin dry process. The "transition process" prepares the substrate for the "spin dry process".

Then, immediately following or "continuous with" the transition operation, Applicants' "spin dry process" is begun by moving the pure-water feed point outward from the center of the substrate while continuing to supply only pure water, from such feed point, at a "second feed amount" that is required to be smaller than the "first feed amount". By this part of the spin dry process, a thin water film is maintained at desired areas on the substrate by virtue of the pure water feed at the recited "second" feed amount. Maintenance of the thin water film will prevent the hydrophobic areas from drying out prematurely. As part of the spin dry process, controlled drying of the substrate occurs from its center as the pure-water feed point is moved radially outwardly, so that, as claim 1 specifies, the substrate will dry "inside of the pure-water feed point". The spin dry process culminates in halting supply of the water from its pure-water feed point when such feed point reaches "near a peripheral edge of the . . . substrate." Substrate rotation, however, is maintained for a time after the water supply is halted. Thereafter, claim 1 terminates in calling for "finishing the spin dry process by stopping rotation" of the substrate and unloading it "without performing any drying process . . . after said stopping rotation". After Applicants' spin dry process has been completed, claim 1 prohibits further drying of the substrate, because such is unnecessary.

Applicants are pleased with the Examiner's indication of agreement that neither Mertens nor Fujiyama, whether taken individually or in combination, teaches or suggests claim 1 with the specific substeps and timing of such substeps as now recited. It was discussed during the interview, and it is emphasized again here that Mertens does not disclose Applicants' cleaning method because Mertens teaches, to those of ordinary skill in the art, a drying method that relies upon gas discharge and liquid supply to control drying of hydrophobic areas. Mertens' method significantly differs from Applicants' concept of spin drying performed by maintaining a very thin pure water film while gradually pushing such film away outward radially from the center of the substrate.

Fujiyama does not remedy these deficiencies of Mertens with respect to amended claim 1. Fujiyama likewise suggests nothing to those of ordinary skill in the art in the way of performing Applicants' three distinct processes culminating in their spin dry process where a

thin film of pure water is controlled to move from the center of the substrate outwardly toward the substrate's radially periphery. Applicants spin dry process gradually pushes water away from the substrate center to maintain accurate control over drying of both hydrophobic and hydrophilic areas on the substrate.

In view of the foregoing amendments and Remarks, it courteously is urged that all of the active claims are allowable, and that this application is in condition for allowance. Favorable action in this regard earnestly is solicited.

Respectfully submitted,
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# APPENDIX A

## AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A substrate cleaning method for cleaning target substrates ~~which~~ comprising:

holding a target substrate having both hydrophobic and hydrophilic areas in a substantially horizontal state;

performing a rinse process on [[a]] the target substrate ~~to be processed with~~ by supplying only pure water ~~supplied to~~ onto a surface ~~thereof~~ of the substrate from a pure-water feed point at a center of the surface while rotating the target substrate ~~in a substantially horizontal state~~; and

~~thereafter performing a spin dry process on the substrate while forming a liquid film in a substantially outer region of a pure water feed point to the substrate by making~~ continuous with the rinse process step, reducing a feed amount of the pure water supplied to the target substrate from the pure-water feed point at the surface center so that the supply is smaller than ~~that~~ the supply of pure water used in ~~at a time of~~ the rinse process ~~and moving said pure water feed point to~~ at the ~~substrate outward from a~~ center ~~of the substrate~~ without stopping the supply of pure water; and

continuous with the reducing of the feed amount step, performing a spin dry process on the target substrate by moving the pure-water feed point outward from the surface center while supplying the pure water at a reduced feed amount to form a liquid film outside of the center surface feed point.

2. (Original) The substrate cleaning method according to claim 1, wherein in said spin dry process, a speed of moving the pure-water feed point to the substrate outward from the center of the substrate is made faster at an outer peripheral portion of the substrate than at the center portion thereof.

3. (Previously Presented) The substrate cleaning method according to claim 1, wherein in said spin dry process, when the pure-water feed point to the substrate reaches a position separated from the center of the substrate by a predetermined distance, movement of

said pure-water feed point is temporarily stopped, and a nitrogen gas is sprayed to the center portion of the substrate, after which spraying of said nitrogen gas is stopped and said pure-water feed point is moved out of the substrate again.

4. (Currently Amended) The substrate cleaning method according to claim 3, wherein in said spin dry process, the pure-water feed point to the substrate is ~~rapidly~~ moved to a position separated from the center of the substrate by 10 to 15 mm, where movement of said pure-water feed point is temporarily stopped, and a nitrogen gas is sprayed to the center portion of the substrate for a predetermined time, after which spraying of said nitrogen gas is stopped and said pure-water feed point is moved out of the substrate again at a speed equal to or less than 3 mm/second.

5. (Previously Presented) The substrate cleaning method according to claim 1, wherein in said spin dry process, after the pure-water feed point to the substrate is shifted from the center of the substrate by a predetermined distance, a nitrogen gas is sprayed to the center portion of the substrate, after which a spray point of said nitrogen gas is moved, together with said pure-water feed point, outward from the center portion of the substrate while spraying the nitrogen gas to the substrate.

6. (Original) The substrate cleaning method according to claim 5, wherein in said spin dry process, only spraying of the nitrogen gas is stopped while moving the spray point of said nitrogen gas, together with said pure-water feed point, outward from the center portion of the substrate.

7. (Previously Presented) The substrate cleaning method according to claim 5, wherein a number of rotations of the substrate in said rinse process is set equal to or greater than 100 rpm and equal to or less than 1000 rpm, and a number of rotations of the substrate in said

spin dry process is set equal to or greater than 800 rpm and equal to or less than 2500 rpm.

8. (Previously Presented) The substrate cleaning method according to claim 1, wherein a number of rotations of the substrate at a time of the spin dry process is set greater than a number of rotations of the substrate at a time of the rinse process.

9. (Original) The substrate cleaning method according to claim 8, wherein a number of rotations of the substrate in said rinse process is set equal to or greater than 100 rpm and equal to or less than 1000 rpm, and a number of rotations of the substrate in said spin dry process is set equal to or greater than 1500 rpm and equal to or less than 2500 rpm.

10. (Canceled)

11. (Withdrawn) A substrate cleaning apparatus comprising:

a spin chuck which holds and rotates a substrate to be processed in a substantially horizontal state;

a pure-water supply mechanism having a pure-water supply nozzle which discharges pure water to a surface of the substrate held by said spin chuck, and a pure-water supply section which supplies the pure water to said pure-water supply nozzle;

a pure-water nozzle scan mechanism which causes said pure-water supply nozzle to scan between above a center of the substrate and above an outer edge thereof; and

a control section which controls said spin chuck, said pure-water supply mechanism and said pure-water nozzle scan mechanism in such a way as to perform a rinse process of feeding the pure water to a surface of the substrate at a predetermined flow rate while rotating the substrate held by said spin chuck, and then perform a spin dry process on the substrate while forming a liquid film in a substantially outer region of a pure-water feed point to the substrate by making a feed amount of the pure water to the substrate smaller than that at a time of the rinse process and moving said pure-water feed point to the substrate outward from a center of the

substrate.

12. (Withdrawn) The substrate cleaning apparatus according to claim 11, wherein in said spin dry process, said control section makes a speed of moving the pure-water feed point outward from the center of the substrate faster at an outer peripheral portion of the substrate than at the center portion thereof.

13. (Withdrawn) The substrate cleaning apparatus according to claim 11, further comprising a gas supply mechanism having a gas nozzle which sprays a nitrogen gas to a center portion of the surface of the substrate held by said spin chuck, and wherein said control section further controls said gas supply mechanism in such a way that in said spin dry process, when the pure-water feed point to the substrate reaches a position separated from the center of the substrate by a predetermined distance, movement of said pure-water feed point is temporarily stopped, and a nitrogen gas is sprayed to the center portion of the substrate, then said pure-water feed point is moved out of the substrate again after spraying of said nitrogen gas is stopped.

14. (Withdrawn) The substrate cleaning apparatus according to claim 13, wherein, said control section, in said spin dry process, rapidly moves the pure-water feed point to the substrate to a position separated from the center of the substrate by 10 to 15 mm, stops movement of said pure-water feed point there, subsequently sprays a nitrogen gas to the center portion of the substrate for a predetermined time, and then stops spraying said nitrogen gas and moves said pure-water feed point out of the substrate again at a speed equal to or less than 3 mm/second.

15. (Withdrawn) The substrate cleaning apparatus according to claim 11, further comprising a gas supply mechanism having a gas nozzle which sprays a nitrogen gas to the surface of the substrate held by said spin chuck, and a gas nozzle scan mechanism which causes said gas nozzle to scan on the target substrate, and wherein said control section further controls

said gas supply mechanism and said gas nozzle scan mechanism in such a way that in said spin dry process, after the pure-water feed point to the substrate is shifted from the center of the substrate by a predetermined distance, a nitrogen gas is sprayed to the center portion of the substrate, then a spray point of said nitrogen gas is moved, together with said pure-water feed point, outward from the center portion of the substrate while spraying the nitrogen gas to the substrate.

16. (Withdrawn) The substrate cleaning apparatus according to claim 15, wherein, said control section, in said spin dry process, stops only spraying of the nitrogen gas while moving the spray point of said nitrogen gas, together with said pure-water feed point, outward from the center portion of the substrate.

17. (Withdrawn) The substrate cleaning apparatus according to claim 11, further comprising a gas supply mechanism having a gas nozzle which sprays a nitrogen gas to the surface of the substrate held by said spin chuck, and wherein said gas nozzle is held apart from said pure-water supply nozzle by a given space by said pure-water nozzle scan mechanism, and said control section further controls said gas supply mechanism in such a way that in said spin dry process, after the pure-water feed point to the substrate is shifted from the center of the substrate by a predetermined distance, a nitrogen gas is sprayed to the center portion of the substrate, then a spray point of said nitrogen gas and said pure-water feed point are simultaneously moved outward from the center portion of the substrate while spraying the nitrogen gas to the substrate.

18. (Withdrawn) The substrate cleaning apparatus according to claim 15, wherein said control section sets a number of rotations of the substrate in said rinse process equal to or greater than 100 rpm and equal to or less than 1000 rpm, and sets a number of rotations of the substrate in said spin dry process equal to or greater than 800 rpm and equal to or less than 2500

rpm.

19. (Withdrawn) The substrate cleaning apparatus according to claim 11, wherein said control section sets a number of rotations of the substrate at a time of the spin dry process greater than a number of rotations of the substrate at a time of the rinse process.

20. (Withdrawn) The substrate cleaning apparatus according to claim 19, wherein said control section sets a number of rotations of the substrate in said rinse process equal to or greater than 100 rpm and equal to or less than 1000 rpm, and sets a number of rotations of the substrate in said spin dry process equal to or greater than 1500 rpm and equal to or less than 2500 rpm.

21. (Withdrawn) A computer readable recording medium having recorded a program for allowing a computer that controls a substrate cleaning apparatus, which performs a rinse process by supplying pure water to a substrate to be processed while rotating the substrate held in an approximately horizontal state, to execute a process of (a) performing a rinse process of feeding the pure water to a surface of the substrate at a predetermined flow rate while rotating the substrate held by said spin chuck, and (b) performing spin dry on the substrate while forming a liquid film in a substantially outer region of a pure-water feed point to the substrate by making a feed amount of the pure water to the substrate smaller than that at a time of said rinse process and moving said pure-water feed point to the substrate outward from a center of the substrate.

22. (Withdrawn) The computer readable recording medium according to claim 21, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that a speed of moving the pure-water feed point to the substrate outward from the center of the substrate is made faster at an outer peripheral portion of the substrate than at the center portion thereof.

23. (Withdrawn) A computer readable recording medium having recorded a program for allowing a computer that controls a substrate cleaning apparatus, which performs a rinse process by supplying pure water to a substrate to be processed while rotating the substrate held in an approximately horizontal state, and further performs spin dry by feeding a nitrogen gas to the substrate, to execute a process of (a) performing a rinse process of feeding the pure water to a surface of the substrate at a predetermined flow rate while rotating the target substrate held by said spin chuck, (b) making a feed amount of the pure water to the substrate smaller than that at a time of said rinse process and moving a pure-water feed point to the substrate outward from a center of the substrate, (c) when the pure-water feed point to the substrate reaches a position separated from the center of the substrate by a predetermined distance, temporarily stopping movement of said pure-water feed point, and spraying a nitrogen gas to the center portion of the substrate, and (d) after spraying of said nitrogen gas is stopped, said pure-water feed point is moved out of the substrate again, thereby performing spin dry on the substrate while forming a liquid film in a substantially outer region of said pure-water feed point.

24. (Withdrawn) The computer readable recording medium according to claim 23, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that in said process (b), the pure-water feed point to the substrate is rapidly moved outward from the center of the substrate, in said process (c), movement of the pure-water feed point is stopped at a position separated from the center of the substrate by 10 to 15 mm, and a nitrogen gas is sprayed to the center portion of the substrate for a predetermined time, and in said process (d), after spraying of said nitrogen gas is stopped, the pure-water feed point is moved out of the substrate again at a speed equal to or less than 3 mm/second.

25. (Withdrawn) A computer readable recording medium having recorded a program for allowing a computer that controls a substrate cleaning apparatus, which performs a rinse process by supplying pure water to a substrate to be processed while rotating the target substrate held in a substantially horizontal state, and further performs spin dry by feeding a

nitrogen gas to the substrate, to execute a process of (a) performing a rinse process of feeding the pure water to a surface of the substrate at a predetermined flow rate while rotating the substrate held by said spin chuck, (b) making a feed amount of the pure water to the substrate smaller than that at a time of said rinse process and moving a pure-water feed point to the substrate outward from a center of the substrate, (c) when the pure-water feed point to the substrate reaches a position separated from the center of the substrate by a predetermined distance, temporarily stopping movement of said pure-water feed point, and spraying a nitrogen gas to the center portion of the substrate, and (d) a spray point of said nitrogen gas is moved, together with said pure-water feed point, outward from the center portion of the substrate while spraying the nitrogen gas to the substrate.

26. (Withdrawn) The computer readable recording medium according to claim 25, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that in said process (d), only spraying of the nitrogen gas is stopped while moving the spray point of said nitrogen gas outward from the center portion of the substrate.

27. (Withdrawn) The computer readable recording medium according to claim 25, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that a number of rotations of the substrate in said process (a) is set equal to or greater than 100 rpm and equal to or less than 1000 rpm, and a number of rotations of the substrate in said processes (b) to (d) is set equal to or greater than 800 rpm and equal to or less than 2500 rpm.

28. (Withdrawn) The computer readable recording medium according to claim 21, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that a number of rotations of the substrate in and following said process (b) is set greater than a number of rotations of the substrate in said process (a).

29. (Withdrawn) The computer readable recording medium according to claim 28, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that a number of rotations of the substrate in said process (a) is set equal to or greater than 100 rpm and equal to or less than 1000 rpm, and a number of rotations of the substrate in and following said process (b) is set equal to or greater than 1500 rpm and equal to or less than 2500 rpm.

30. (Withdrawn) The computer readable recording medium according to claim 23, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that a number of rotations of the substrate in and following said process (b) is set greater than a number of rotations of the substrate in said process (a).

31. (Withdrawn) The computer readable recording medium according to claim 30, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that a number of rotations of the substrate in said process (a) is set equal to or greater than 100 rpm and equal to or less than 1000 rpm, and a number of rotations of the substrate in and following said process (b) is set equal to or greater than 1500 rpm and equal to or less than 2500 rpm.

32. (Withdrawn) The computer readable recording medium according to claim 25, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that a number of rotations of the substrate in and following said process (b) is set greater than a number of rotations of the substrate in said process (a).

33. (Withdrawn) The computer readable recording medium according to claim 32, wherein said program causes said computer to control said substrate cleaning apparatus in such a way that a number of rotations of the substrate in said process (a) is set equal to or greater than 100 rpm and equal to or less than 1000 rpm, and a number of rotations of the substrate in and following said process (b) is set equal to or greater than 1500 rpm and equal to or less than 2500 rpm.